Amendments to the Claims

1. (Currently Amended) An apparatus for performing a specific binding assay, the apparatus comprising:

a composite waveguide comprising:

> a substrate comprising a first optical material of refractive index n_1 and having a first planar surface and an opposite second surface, and

> a waveguide film comprising a second optical material having a refractive index n_2 which is greater than refractive index n_1, said waveguide film disposed on said first planar surface of said substrate;

capture molecules, associated with said waveguide film, for interacting selectively with at least one type of selected analyte molecule;

a light source operably disposed to direct a light beam into said composite waveguide for propagation by total internal reflection therein; and

a light detection device positioned to collect light emitted from a surface of said waveguide film; and

an optical coupling element comprised of a waveguide coupler disposed on an upper surface of said waveguide film and opposite said first planar surface of said substrate, wherein said waveguide coupler is further comprised of an input waveguide that is comprised of an optical material having a refractive index n_3 and a thickness of between about 0.5 mm and about 5 mm and a precise spacing layer to evanescently couple light into said waveguide film across said precise spacing layer, said spacing layer comprises an optical material having a refractive index n_4, where $n_4 < n_2$ and $n_4 < n_3$.

11. (Original) The apparatus of claim 9, wherein said input waveguide comprises an optical material having a refractive index n_3 and a thickness of between about 0.5 mm and about 5 mm.

12. (Previously Presented) The apparatus of claim 11, wherein said spacing layer comprises an optical material having a refractive index n_4, where $n_4 < n_2$ and $n_4 < n_3$, said spacing layer having a thickness selected to optimize evanescent coupling of light from said input waveguide into said waveguide film.

2. (Previously Presented) The apparatus of claim 1, wherein said light detection device is positioned to detect light passing through said opposite second surface of said substrate of said composite waveguide.

3. (Canceled)

4. (Currently Amended) The apparatus of claim [[3]] 1, wherein said optical coupling element comprises at least one prism that focuses light into said waveguide film.

5. (Currently Amended) The apparatus of claim [[3]] 1, wherein said optical coupling element comprises a diffraction grating that diffracts light into said waveguide film.

6. (Original) The apparatus of claim 5, wherein said diffraction grating is formed into said waveguide film at an upper surface thereof, opposite said first planar surface of said substrate.

7. (Original) The apparatus of claim 5, wherein said diffraction grating is formed into at least one of said first planar surface of said substrate and a surface of said waveguide film adjacent to said first planar surface.

8. (Canceled)

9. (Canceled)

10. (Canceled)

11. (Canceled)

12. (Canceled)

13. (Original) The apparatus of claim 1, wherein said substrate has a thickness of at least about 10 μm.

14. (Original) The apparatus of claim 1, wherein said waveguide film has a thickness of at least about 0.1 μm.

15. (Original) The apparatus of claim 1, wherein said first optical material comprises at least one of silicon dioxide, quartz, fused silica, silicon oxynitride, and magnesium fluoride.

16. (Original) The apparatus of claim 1, wherein said second optical material comprises at least one of silicon oxynitride and silicon dioxide.

17. (Original) The apparatus of claim 1, wherein said light source comprises a laser.

18. (Previously Presented) The apparatus of claim 1, wherein said light detection device comprises a charge-coupled device.

19. (Original) The apparatus of claim 1, wherein said composite waveguide further comprises a sample reservoir configured to contain a sample solution adjacent to a surface of said waveguide film.

20. (Previously presented) The apparatus of claim 19, wherein said sample reservoir contains a sample solution comprising a plurality of molecules of a selected analyte and a plurality of tracer molecules, said tracer molecules being activated by evanescent light escaping from said waveguide film into said sample solution.

21. (Original) The apparatus of claim 1, wherein said capture molecules are of a plurality of different types.

22. (Previously Presented) The apparatus of claim 21, wherein said different types of said capture molecules are positioned at discrete locations from one another on a surface of said waveguide film.

23. (Original) The apparatus of claim 22, wherein said discrete locations are arranged in an array.

24. (Original) The apparatus of claim 21, wherein said different types of capture molecules are capable of reacting with at least two different analytes.

25. (Original) The apparatus of claim 21, wherein said different types of capture molecules are capable of reacting with at least four different analytes.

64. (Previously Presented) An apparatus for performing a specific binding assay, the apparatus comprising:

a composite waveguide comprising:

a substrate comprising a first optical material of refractive index n, and having a first planar surface and an opposite second surface, and

a waveguide film comprising a second optical material having a refractive index n_2 which is greater than refractive index n,, said waveguide film disposed on said first planar surface of said substrate;

capture molecules, associated with said waveguide film, for interacting selectively with at least one type of selected analyte molecule;

a light source operably disposed to direct a light beam into said composite waveguide for propagation by total internal reflection therein;

an optical coupling element comprising a waveguide coupler:

disposed on an upper surface of said waveguide film, opposite said first planar surface of said substrate,

that directs light into said waveguide film by evanescent coupling, and

that includes an input waveguide and a spacing layer to evanescently couple light into said waveguide film across said spacing layer, the input waveguide comprising an optical material having a refractive index n, and a thickness of between about 0.5 mm and about 5 mm; and

a light detection device positioned to collect light emitted from a surface of said waveguide film.

65. (Previously Presented) The apparatus of claim 64, wherein said light detection device is positioned to detect light passing through said opposite second surface of said substrate of said composite waveguide.

66. (Previously Presented) The apparatus of claim 64, wherein said optical coupling element comprises at least one prism that focuses light into said waveguide film.

67. (Previously Presented) The apparatus of claim 64, wherein said optical coupling element comprises a diffraction grating that diffracts light into said waveguide film.

68. (Previously Presented) The apparatus of claim 67, wherein said diffraction grating is formed into said waveguide film at an upper surface thereof, opposite said first planar surface of said substrate.

69. (Previously Presented) The apparatus of claim 67, wherein said diffraction grating is formed into at least one of said first planar surface of said substrate and a surface of said waveguide film adjacent to said first planar surface.

70. (Previously Presented) The apparatus of claim 64, wherein said spacing layer comprises an optical material having a refractive index n,,, where $n_4 < n$, and $n_4 < n$,, said spacing layer having a thickness selected to optimize evanescent coupling of light from said input waveguide into said waveguide film.

71. (Previously Presented) The apparatus of claim 64, wherein said waveguide film has a thickness of at least about 0.1 μm.

72. (Previously Presented) The apparatus of claim 64, wherein said first optical material comprises at least one of silicon dioxide, quartz, fused silica, silicon oxynitride, and magnesium fluoride.

73. (Previously Presented) The apparatus of claim 64, wherein said second optical material comprises at least one of silicon oxynitride and silicon dioxide.

74. (Previously Presented) The apparatus of claim 64, wherein said light source comprises a laser.

75. (Previously Presented) The apparatus of claim 64, wherein said light detection device comprises a charge-coupled device.

76. (Previously Presented) The apparatus of claim 64, wherein said composite waveguide further comprises a sample reservoir configured to contain a sample solution adjacent to a surface of said waveguide film.

77. (Previously Presented) The apparatus of claim 76, wherein said sample reservoir contains a sample solution comprising a plurality of molecules of a selected analyte and a plurality of tracer molecules, said tracer molecules being activated by evanescent light escaping from said waveguide film into said sample solution.

78. (Previously Presented) The apparatus of claim 64, wherein said capture molecules are of a plurality of different types.

79. (Previously Presented) The apparatus of claim 78, wherein said different types of said capture molecules are positioned at discrete locations from one another on a surface of said waveguide film.

80. (Previously Presented) The apparatus of claim 79, wherein said discrete locations are arranged in an array.

81. (Previously Presented) The apparatus of claim 78, wherein said different types of capture molecules are capable of reacting with at least two different analytes.

82. (Previously Presented) The apparatus of claim 78, wherein said different types of capture molecules are capable of reacting with at least four different analytes.

83. (Currently Amended) An apparatus for performing a specific binding assay, the apparatus comprising:

a composite waveguide comprising:

a substrate comprising a first optical material of refractive index n, and having a first planar surface and an opposite second surface, and

a waveguide film comprising a second optical material having a refractive index n_2 which is greater than refractive index n,, said waveguide film disposed on said first planar surface of said substrate;

capture molecules, associated with said waveguide film, for interacting selectively with at least one type of selected analyte molecule;

a light source operably disposed to direct a light beam into said composite waveguide for propagation by total internal reflection therein; and

a light detection device positioned to collect light emitted from a surface of said waveguide film; ~~and~~

a sample reservoir configured to contain a sample solution adjacent to a surface of said waveguide film; and

an optical coupling element comprised of a waveguide coupler disposed on an upper surface of said waveguide film and opposite said first planar surface of said substrate,

wherein said waveguide coupler is further comprised of an input waveguide that is comprised of an optical material having a refractive index n_3 and a thickness of between about 0.5 mm and about 5 mm and a precise spacing layer to evanescently couple light into said waveguide film across said precise spacing layer, said spacing layer comprises an optical material having a refractive index n_4, where $n_4 < n_2$ and $n_4 < n_3$.

84. (Previously Presented) The apparatus of claim 83, wherein said light detection device is positioned to detect light passing through said opposite second surface of said substrate of said composite waveguide.

85. (Canceled)

86. (Currently Amended) The apparatus of claim [[85]] 83, wherein said optical coupling element comprises at least one prism that focuses light into said waveguide film.

87. (Currently Amended) The apparatus of claim [[85]] 83, wherein said optical coupling element comprises a diffraction grating that diffracts light into said waveguide film.

88. (Previously Presented) The apparatus of claim 87, wherein said diffraction grating is formed into said waveguide film at an upper surface thereof, opposite said first planar surface of said substrate.

89. (Previously Presented) The apparatus of claim 87, wherein said diffraction grating is formed into at least one of said first planar surface of said substrate and a surface of said waveguide film adjacent to said first planar surface.

90. (Canceled)

91. (Canceled)

92. (Canceled)

93. (Previously Presented) The apparatus of claim 83, wherein said waveguide film has a thickness of at least about 0.1 μm.

94. (Previously Presented) The apparatus of claim 83, wherein said first optical material comprises at least one of silicon dioxide, quartz, fused silica, silicon oxynitride, and magnesium fluoride.

95. (Previously Presented) The apparatus of claim 83, wherein said second optical material comprises at least one of silicon oxynitride and silicon dioxide.

96. (Previously Presented) The apparatus of claim 83, wherein said light source comprises a laser.

97. (Previously Presented) The apparatus of claim 83, wherein said light detection device comprises a charge-coupled device.

98. (Previously Presented) The apparatus of claim 83, wherein said capture molecules are of a plurality of different types.

99. (Previously Presented) The apparatus of claim 98, wherein said different types of said capture molecules are positioned at discrete locations from one another on a surface of said waveguide film.

100. (Previously Presented) The apparatus of claim 99, wherein said discrete locations are arranged in an array.

101. (Previously Presented) The apparatus of claim 98, wherein said different types of capture molecules are capable of reacting with at least two different analytes.

102. (Previously Presented) The apparatus of claim 98, wherein said different types of capture molecules are capable of reacting with at least four different analytes.

103. (Currently Amended) An apparatus for performing a specific binding assay, the apparatus comprising:

a composite waveguide comprising:

a substrate comprising a first optical material of refractive index n, and having a first planar surface and an opposite second surface, and

a waveguide film comprising a second optical material having a refractive index n_2 which is greater than refractive index n1, said waveguide film disposed on said first planar surface of said substrate;

a plurality of different types of capture molecules associated with said waveguide film, each type of capture molecules configured to interact selectively with at least one type of selected analyte molecule, different types of capture molecules of said plurality positioned at discrete locations from one another and arranged in an array on a surface of said waveguide film;

a light source operably disposed to direct a light beam into said composite waveguide for propagation by total internal reflection therein; ~~and~~

a light detection device positioned to collect light emitted from a surface of said waveguide film; and

an optical coupling element comprised of a waveguide coupler disposed on an upper surface of said waveguide film and opposite said first planar surface of said substrate, wherein said waveguide coupler is further comprised of an input waveguide that is comprised of an optical material having a refractive index n_3 and a thickness of between about 0.5 mm and about 5 mm and a precise spacing layer to evanescently couple light into said waveguide film across said precise spacing

layer, said spacing layer comprises an optical material having a refractive index n_4, where $n_4 < n_2$ and $n_4 < n_3$.

104. (Previously Presented) The apparatus of claim 103, wherein said light detection device is positioned to detect light passing through said opposite second surface of said substrate of said composite waveguide.

105. (Canceled)

106. (Currently Amended) The apparatus of claim [[105]] 103, wherein said optical coupling element comprises at least one prism that focuses light into said waveguide film.

107. (Currently Amended) The apparatus of claim [[105]] 103, wherein said optical coupling element comprises a diffraction grating that diffracts light into said waveguide film.

108. (Previously Presented) The apparatus of claim 107, wherein said diffraction grating is formed into said waveguide film at an upper surface thereof, opposite said first planar surface of said substrate.

109. (Previously Presented) The apparatus of claim 107, wherein said diffraction grating is formed into at least one of said first planar surface of said substrate and a surface of said waveguide film adjacent to said first planar surface.

110. (Canceled)

111. (Canceled)

112. (Canceled)

113. (Previously Presented) The apparatus of claim 103, wherein said waveguide film has a thickness of at least about 0.1 μm.

114. (Previously Presented) The apparatus of claim 103, wherein said first optical material comprises at least one of silicon dioxide, quartz, fused silica, silicon oxynitride, and magnesium fluoride.

115. (Previously Presented) The apparatus of claim 103, wherein said second optical material comprises at least one of silicon oxynitride and silicon dioxide.

116. (Previously Presented) The apparatus of claim 103, wherein said light source comprises a laser.

117. (Previously Presented) The apparatus of claim 103, wherein said light detection device comprises a charge-coupled device.